

### Detailed Description

The development of instrumentation useful in extremely high vacuum environments that do not cause measurement disruptive releases of adsorbed gases has been a perplexing problem. Since most such prior art devices rely of thermoionic electron emitters the release of the interfering gases is an inherent property of the emission process. As described above, attempts to solve the problem using cold field emitters have proven largely similarly ineffective due to the relatively large surface areas of such emitters that also desorb gases. The use of thin films of diamonds ( $< 5\mu$ ) or diamond chips embedded in a suitable matrix has also proven of limited effectiveness.

It has now been discovered that the use of single or arrays of "solid" diamond emitters obviate the interference/disturbance problems indicated with prior art systems. According to the present invention there is provided a "solid" diamond i.e. greater than  $5\mu$  thick (T in Figure 2), emitter that has been "machined" using non-contact techniques to a point having a radius of less than about  $10\mu$  and preferably between about 5 and about 10 angstroms.

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As shown in Figures 1-3, preparation of the solid diamond field emitters of the present invention first involves (Fig. 1) selection of a raw diamond 10 having octahedrons at a level of between about 700-900 per carat or between about 0.5 and